Microsoft Exchange Server

Inside Exchange Internet Mail Service

White Paper

The information contained in this document represents the current view of Microsoft Corporation on the issues discussed as of the date of publication. Because Microsoft must respond to changing market conditions, it should not be interpreted to be a commitment on the part of Microsoft, and Microsoft cannot guarantee the accuracy of any information presented after the date of publication.

This White Paper is for informational purposes only. MICROSOFT MAKES NO WARRANTIES, EXPRESS OR IMPLIED, AS TO THE INFORMATION IN THIS DOCUMENT.

Complying with all applicable copyright laws is the responsibility of the user. Without limiting the rights under copyright, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise), or for any purpose, without the express written permission of Microsoft Corporation.

Microsoft may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Microsoft, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

 2000 Microsoft Corporation. All rights reserved.

Microsoft, MS-DOS, Windows, Windows NT, are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. The names of actual companies and products mentioned herein may be the trademarks of their respective owners.

Table of Contents

Introduction....1

Internet Mail Service Interactions with Other Exchange Components....1
- Internet Mail Service Interaction with the Information Store and Directory Service....1
- Internet Mail Service Interaction with the Message Transfer Agent....1

Mail Flow to Internet Mail Service....2

Mail Flow from Internet Mail Service....4

Internet Mail Service Internal Architecture....5
- Internet Mail Service Disk Layout....5
- Internet Mail Service Major Components....5
- Information Store Components Related to Internet Mail Service....5
- Content Conversion Engine....5

Internet Mail Service Internal Message Flow....6
- Outbound Waiting Conversion (MTS-OUT)....6
- Inbound Waiting Delivery (MTS-IN)....7

Internet Mail Service Rerouting....10
- Inbound Rerouting....10
- Rewriting RFC 822 Addresses....10

Internet Mail Service Startup Procedures....11

Internet Mail Service As a Site Connector....11

Internet Mail Service Registry Settings....11

Internet Mail Service Diagnostic Logging....18

Introduction

The Internet Mail Service (IMS) is a Microsoft® Windows NT® service that is installed on computers running Microsoft Exchange Server. This service provides the ability to send and receive mail from computers that support the Simple Mail Transfer Protocol (SMTP), defined by Internet Engineering Task Force (IETF) Request For Comments (RFC) 821 and 822.

SMTP is the predominant standard for sending messages between hosts on the Internet. It is an application layer protocol that defines procedures for transferring mail between two computers over TCP/IP. It defines the message format and method for sending messages from one host to another. TCP/IP must be installed and configured on the computer running Exchange Server to use the Internet Mail Service.

TCP/IP and SMTP work together to provide messaging connectivity to SMTP hosts. It is possible to create and administer the IMS using the Microsoft Exchange Server Administrator program. You can run the Exchange Administrator program from any computer running Windows NT that can establish a Remote Procedure Call (RPC) session to the computer running Exchange Server.

Internet Mail Service Interactions with Other Exchange Components

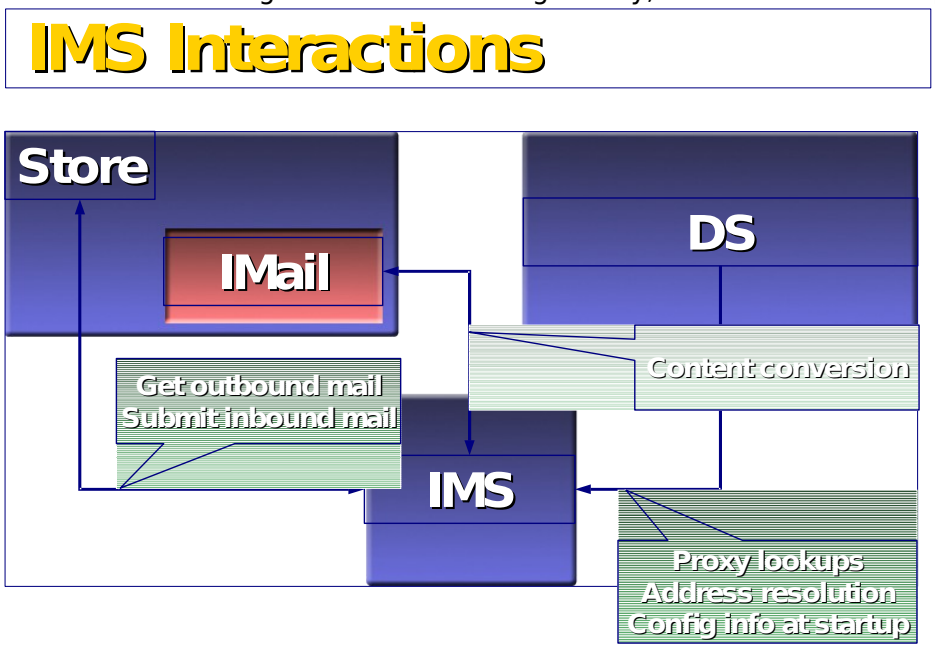
Computers running Exchange Server use various components to exchange messages with SMTP-based mail systems.

Internet Mail Service Interaction with the Information Store and Directory Service

The IMS process (Msexcimc.exe) uses the IPC (LRPC) mechanism to communicate with the Information Store and the Directory Service (DS). It connects to the Information Store to retrieve and submit mail and to perform content conversions via the IMAIL sub-component of the Information Store. It connects to the DS to get configuration information and to translate Exchange native addresses into and from Internet addresses.

Internet Mail Service Interaction with the Message Transfer Agent

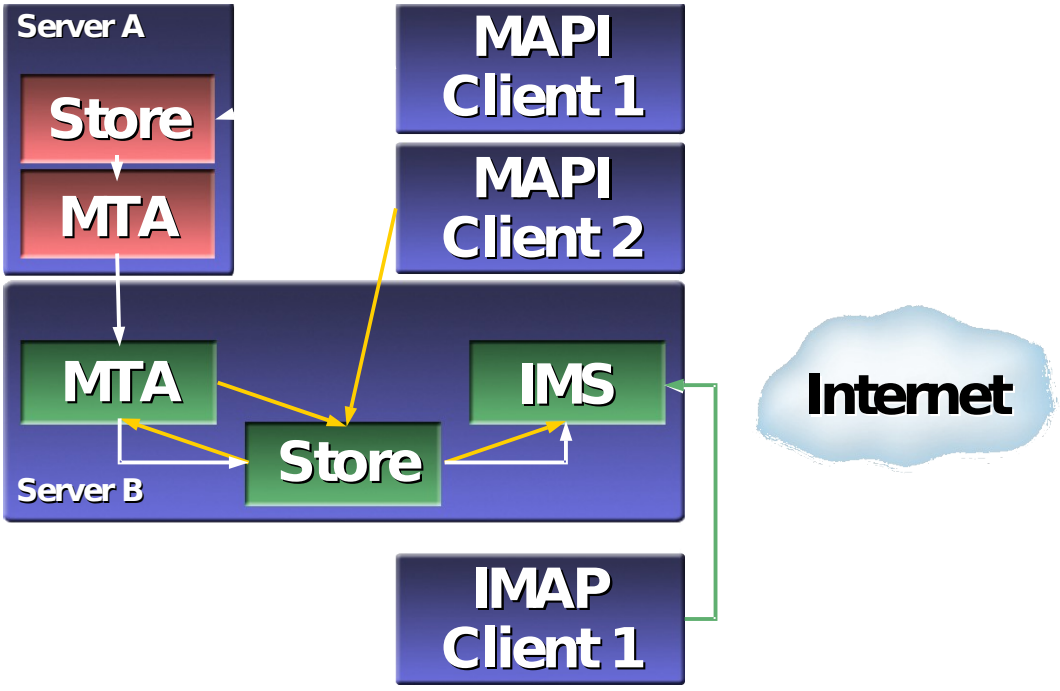
The IMS and message transfer agent (MTA) do not directly interact with each other; however the MTA routes mail to an IMS. The IMS acts like other gateways, including the Microsoft Mail gateway, and the MTA has a queue for each



gateway's mail. The MTA puts mail into the IMS's outbound folder in the information store, where the IMS picks it up.

Mail Flow to Internet Mail Service

Mail Flow To IMS



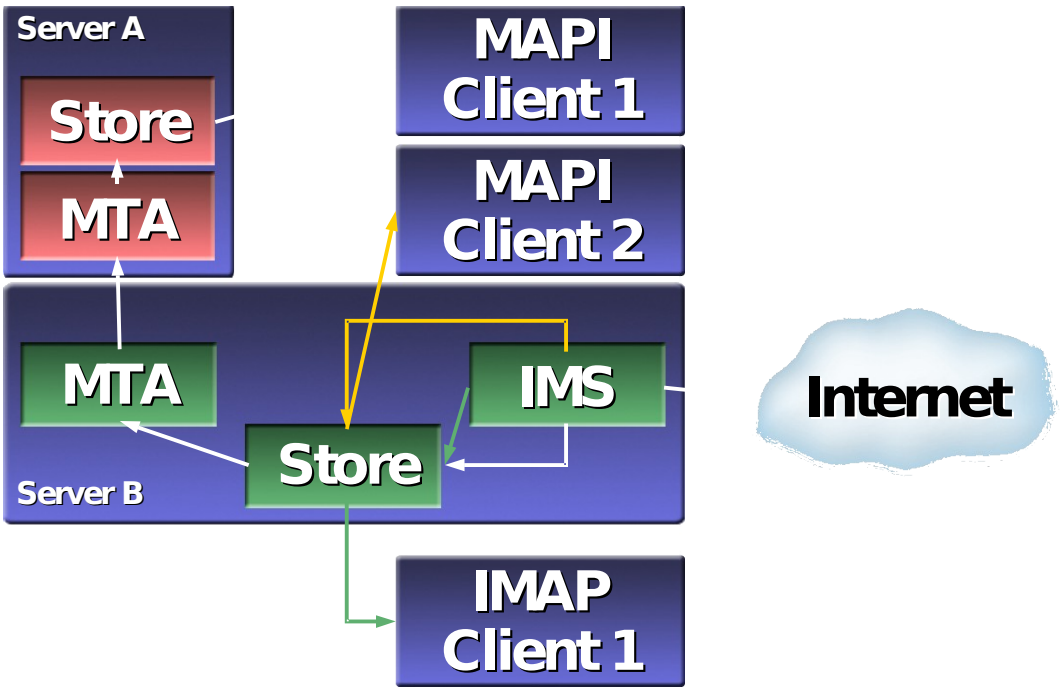
Step-by-Step

- The client composes a message to an external SMTP address.
- After he or she sends the message, it goes to the user's outbox on the server.
- The Information Store looks at the message and determines whether the recipient is local or external, in which case the message needs to go to another server.
- After it is determined that the recipient is external, the message is flagged for the MTA to pick it up.
- After the MTA picks up the message, it looks at the destination address. The MTA then looks at the GWART (or Routing Table) to determine which IMS to route the message to based on the rules of routing.
- After the route is determined and the message has been routed to the appropriate server within the Exchange organization, the message is placed into the MTA's queue for the IMS on the appropriate server.
- The MTA then moves the message from that queue to the MTS-OUT queue for the Internet Mail Service. At this point, the MTA's job is done.

- The IMS picks up the message from the MTS-OUT (also known as Outbound Waiting Conversion) queue and streams the message data to IMAIL in the information store. IMAIL does content-conversion to convert the message from MDBEF format to SMTP Multipurpose Internet Mail Extenstions (MIME) or UUencode format.
- After content-conversion is complete, the message is written to the \ Imcdata\Out directory as an 8-digit alphanumeric file name. An entry is added to the \Imcdata\Queue.dat file. It states that there is a message now waiting to be delivered, lists the host for which it's destined, and displays the current status of the message.
- The IMS then reads in the message from the \Imcdata\Out to get the destination host name.
- If the destination host name is known or if the IMS is set to forward all mail to a certain host, then the IMS looks to see if this is a host that it recognizes via the EMAIL DOMAINS lists. If not, it does a domain name system (DNS) lookup to resolve the host name to an IP address.
- At this point, the IMS makes a connection on port 25 to the destination host (or the mailer responsible for the destination host) and initiates the RFC 821 command structure.
- After delivery is complete, the entry for this message is removed from the \Imcdata\Queue.dat file and the IMS resets for a new message to the same host or closes the connection if there are no more messages for this host.

Mail Flow from Internet Mail Service

Mail Flow From IMS



Step-by-Step

- The IMS accepts an SMTP connection from another host.
- The data from the message is streamed to a file in the \Imcdata\Work directory.
- After the message is completely received in, it is moved to the \Imcdata\In directory and the Queue.dat file is updated saying that there is new inbound mail.
- The IMS looks at the message and determines if the message is destined for a user in its organization (by looking at the <inbound> domains on the rerouting page).
- If the recipient is not in the local domain, the message is re-queued for SMTP outbound transmission.
- If the recipient is in the local domain (organization), the IMS does a lookup in the directory to find the recipient.
- If the recipient is known in the Exchange directory, the IMS streams the message through IMAIL for content conversion and then places the message into MTS-IN.
- If the recipient is local on the server, the Information Store delivers the message to the recipient. If the recipient is not local, the MTA picks up and routes the message accordingly.

Internet Mail Service Internal Architecture

Internet Mail Service Disk Layout

The IMS creates several folders and files in the %EXCHSRVR%\Imcdata folder. Below is the summary and usage of these folders and files.

- Imcdata\Queue.dat is a file containing in and out queues.
- Imcdata\In contains inbound mail.
- Imcdata\Out contains outbound mail.
- Imcdata\Log contains protocol logs.
- Imcdata\Pickup is where the IMS picks up RFC 822 text files and sends them as e-mail messages.
- In and Out directories may contain an archive folder if archiving is enabled.

Internet Mail Service Major Components

The IMS has four major components that deal with the movement of the message within the IMS:

- Inbound MAPI
- Outbound MAPI
- Inbound SMTP
- Outbound SMTP

The following paragraphs describe these components in more detail.

Information Store Components Related to Internet Mail Service

Two internal folders in the Information Store manage messages to and from the IMS:

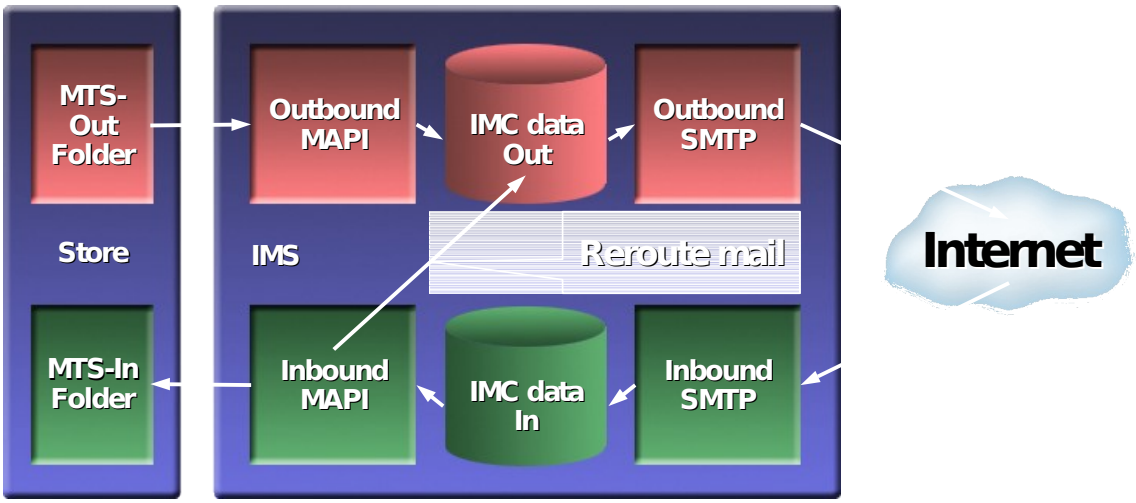
- MTS-IN manages messages for Inbound Waiting Delivery to a recipient’s mailbox.
- MTS-Out manages messages for outbound mail to the IMS Waiting Conversion.

Content Conversion Engine

IMAIL performs the content conversion from MDBEF to SMTP format and is part of the Information Store.

Internet Mail Service Internal Message Flow

IMS Internal Message Flow



Outbound Waiting Conversion (MTS-OUT)

Location: Information Store
The MTA places messages that need to be delivered by the IMS in this location. This flags the IMS to pick up the messages and stream them through content-conversion. Once content-conversion is complete, the messages are placed in the Outbound MAPI delivery queue.

IMS MAPI Outbound

Location: IMS Process
Following are the tasks provided by the IMS MAPI Outbound process:

- Looks up SMTP proxies
- Determines required bifurcations, based on content configuration settings (Rich Text, MIME vs UUencode, and so forth)
- Calls IMAIL for each bifurcation
- Writes RFC 822 content and binary headers to the spool file in Imcdata\Out
- Adds an entry for the message and each recipient in the Imcdata\Queue.dat file
- Deletes the message in the information store

IMS SMTP Outbound
Location: IMS process
Following are the tasks provided by the IMS SMTP outbound process:

- Reads from Queue.dat to determine messages or receipts to be delivered
- Batches deliveries to a destination
- When a receipt is delivered, it is marked in the Queue.dat file

When a message is fully delivered, the entry is removed from Queue.dat and the spool file is removed.

Inbound Waiting Delivery (MTS-IN)

Location: Information Store
After inbound messages have been content-converted, they are placed here to be sent to the recipient's mailbox or to be rerouted out via a custom recipient.

IMS SMTP Inbound
Location: IMS Process
Following are the tasks provided by the IMS SMTP inbound process:

- Accepts mail from SMTP hosts
- Writes a file to the disk in Imcdata\In
- Makes an entry in Queue.dat
- Acknowledges receipt of the message

IMS MAPI Inbound
Location: IMS Process
Following are the tasks provided by the IMS MAPI inbound process:

- If the message needs to be rerouted to the recipient, the IMS MAPI copies the file into Imcdata\Out and adds the message & recipients to the Queue.dat file.

For remaining recipients, the IMS MAPI:

- Resolves addresses
- Calls IMAIL to convert the message
- Submits the message to the Information Store
- Deletes the file from the disk if the submission is successful

Content-Conversion

Location: Information Store
The Content-Conversion engine in Exchange is built into the Information Store (Store.exe). This was done to account for the other customers (or components of Exchange) that have need for content-conversion (that is, INS, STORE-POP3, STORE-IMAP4, IMS). The Content-Conversion engine is responsible for conversion

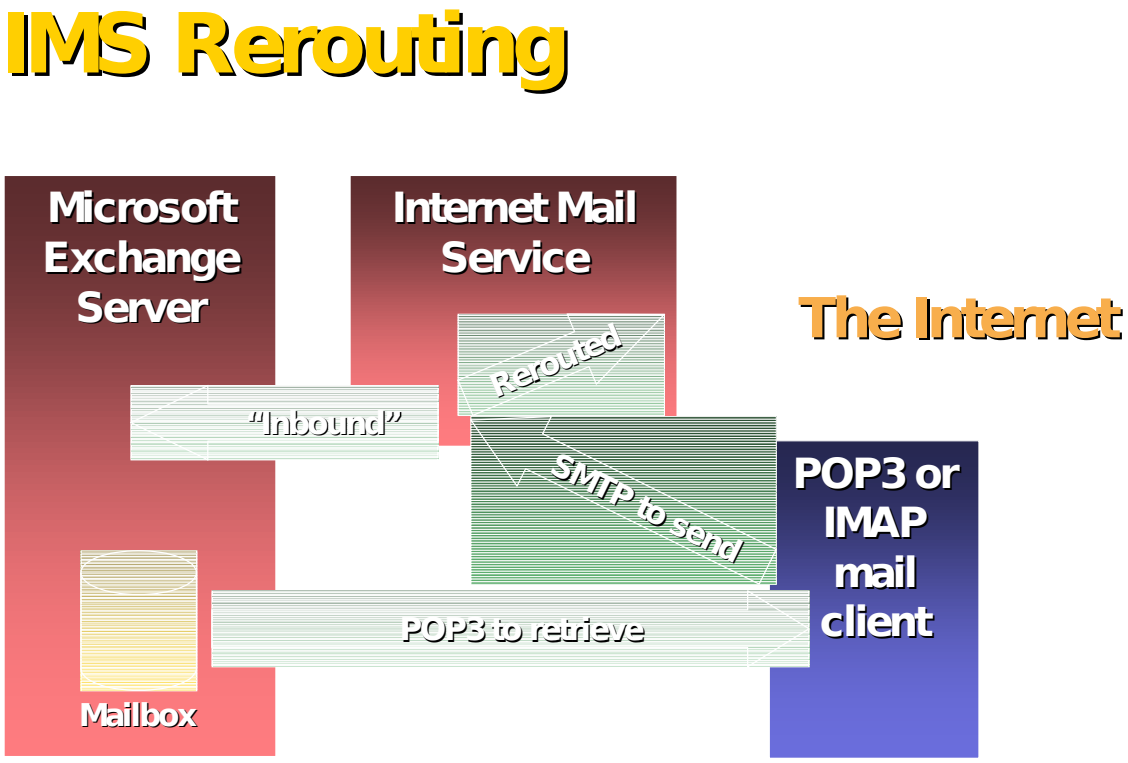
to and from NNTP (MIME, UUencode, HTML), POP3 (MIME, UUencode, HTML), IMAP4 (MIME, UUencode, HTML), and SMTP (MIME, UUencode, HTML).

Report Handling

When the IMS generates non-delivery reports (NDRs), they are always submitted via Inbound MAPI to the MTS-IN folder in the information store. The benefit of this approach is that one central facility exists for generating NDRs in the IMS. Some NDRs are handled by MTA.

Internet Mail Service Rerouting

The IMS can be configured to reroute messages inbound to Exchange out to other domains.



Inbound Rerouting

Inbound Routing can handle POP3/IMAP4 clients. A key advantage is to allow the IMS to be the central SMTP portal to the Internet by relaying mail to other hosts.

Note: If used incorrectly, this feature allows third parties to use your system to send e-mail to other third parties (relay mail through your system). This is commonly done to send unsolicited commercial e-mail (UCE, also known as spam). If you enable this feature on an Internet-accessible computer, be sure to use the Relay Restrictions UI in Exchange version 5.5 service pack 1 or later that

allows you to permit only certain hosts (via IP address restrictions) to relay mail. See Knowledge Base articles Q193922 and Q196626 for more detailed information.

Rewriting RFC 822 Addresses

When rerouting, the IMS can be configured to rewrite RFC 822 header addresses. With this feature, all addresses from your company can appear as user@xyz.com even though internally they are user@systemx.xyz.com.
Set registry key (see below) RerouteViaStore = 1 (REG_DWORD) to enable this feature.

Note: Setting this key has a negative performance impact, because it forces content conversion in the case of SMTP relay, where no conversion is normally done.

Internet Mail Service Startup Procedures

The IMS Startup procedure contains the following steps:

- Read DS and registry configuration information
- Logon to the Information Store
- Validate Queue.dat
- Scan In and Out directories for files not present
- Ensure integrity

Internet Mail Service As a Site Connector

The IMS can be used as a Site Connector, in the case where you want to explicitly use the SMTP protocol for messaging connectivity between Exchange sites. However, because the Site Connector uses native Exchange message format and consequently does not have to perform content conversion on each end, in many cases, the Site Connector gives better performance.

The IMS uses a scheme for encapsulating addresses to send foreign addresses within the constraints of SMTP RFCs. An encapsulated address is of the form: IMCEAX400-_c=us_p=ms_g=me. The scheme allows the IMS to generate a legal SMTP replyable From address for senders with a foreign address, even if they have no Custom Recipient (CR) in the Exchange system. (If they have a CR, the primary SMTP proxy on the CR is used as the From address.)

Internet Mail Service Registry Settings

The IMS can be configured via the registry. These registry parameters allow you to tune the IMS based on the load and requirements of a particular environment.

Below is a list of some of the parameters. You should not change any of the IMS registry values unless you are familiar with the full effect of the change. These values are set in the Windows NT Registry Editor. The registry keys are:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\MSExchangeIMC\Parameters\<parameter>

For example,
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\MSExchangeIMC\Parameters\BadInMessageAction = 1
Note: All values of registry keys are hexadecimal.

AcceptMalformed821Adrs

Type: REG_DWORD Default Value: 1
Creating this entry with a value of 1 relaxes the RFC 821 checking.

AdvertiseSMTPExtensions

Type: REG_DWORD Default Value: 1

The default value is **1** (true). If set to **0** (false), the IMS will not advertise any ESMTP extensions in response to EHLO.

AlwaysUseETRN

Type: REG_DWORD Default Value: 1

This parameter forces Exchange to send the ETRN command to all hosts to which it connects, regardless of the method of connection (LAN, RAS). It is recommended to use this only when connecting to a single host for mail delivery. Using this entry with DNS can drastically reduce the performance of the IMS.

BadInMessageAction

Type: REG_DWORD Default Value: 0x1

Set this registry parameter to 1 to save inbound messages that cannot be processed by the IMS and have NDRs saved to a Bad directory under the Imcdata\In directory.

BadOutMessageAction

Type: REG_DWORD Default Value: 0x1

Set this registry parameter to 1 to save outbound messages that cannot be processed by the IMS and have NDRs saved to a Bad directory under the Imcdata\Out directory.

CommonName

Type: REG_SZ Default Value: Internet Mail Connector (ServerName)

This parameter contains the display name of the IMS installed on this server. This must match the name of the server as listed in the directory. It is not recommended that this be changed.

DequeueMethodData

Type: REG_MULTI_SZ Default Value:

This parameter contains information about the dequeuing method for the IMS to use (such as TURN, ETRN, custom command, and so forth). This also contains information for specific hosts to use ETRN against.

DisableLoopbackConnections

Type: REG_DWORD Default Value: 0

The IMS allows configurations where SMTP connections are made to itself. There are cases where this behavior is desired, such as when one Exchange user addresses another using an SMTP proxy. However, this can also allow loopbacks and cause inefficient configurations. You can configure the IMS so that it won't initiate SMTP connections if the destination host's IP address matches its own. Instead, the IMS will create an NDR for the message. To enable the Internet Mail Connector's connection loopback detection, set the DWORD registry value to 1.

DisableResolverSearchList

Type: REG_DWORD Default Value: 0

If you are using a wildcard MX DNS record, the IMS will append the default domain from your TCP/IP configuration to each host name before trying to resolve it in DNS. To prevent this, set the DisableResolverSearchList value to 1. This setting stops the IMS from appending a domain to host names before trying to resolve them.
The resolver search list is a list of domains that the resolver appends to the name before attempting lookup. Each domain is appended in turn, and the lookup is attempted. If none of the queries using the domains from the search list succeed, the name is looked up by itself, in case it is fully qualified. The search list is set by the registry key **SearchList**.

DiskSpaceLowWaterMark

Type: REG_DWORD Default Value: 0x00A00000

When available disk space reaches this value, the IMS will stop accepting incoming mail. The default value is 10 MB (the value is the number of bytes, in hexadecimal form).

EnableMIMEWrap

Type: REG_DWORD Default Value: 0

EnableMIMEWrap controls word-wrap in outgoing non-TNEF MIME messages. If it is enabled, lines in MIME messages are wrapped at a fixed column. If EnableMIMEWrap is disabled (and UseRTFText is also disabled), lines are wrapped using quoted printable encoding. MIME-enabled readers will unwrap the

lines, restoring the original text flow, but users with non-MIME readers will see a "=" character appended to each wrapped line of text. EnableMIMEWrap is enabled by default. UseRTFText also affects word-wrap. If enabled, text lines in all non-TNEF messages are wrapped at a fixed column, regardless of the setting of EnableMIMEWrap. If this is set to 1, the word-wrap setting for non-MIME messages on the Internet Mail Service properties in the Exchange Server Administrator program is ignored.

ExtensionDLL

Type: REG_SZ Default Value: c:\exchsrvr\connect\msexcimc\bin\imcext.dll

This parameter points to an IMS message routing extension DLL. This value should exist only if an extension DLL is used.

HomeDSA

Type: REG_SZ Default Value: <ServerName>

Enter the name of the server with the directory that the IMS should use to check whether the recipient is known within the Exchange organization.

InboundThreads

Type: REG_DWORD Default Value: 1

By default, the number of Inbound threads is 1. The number of inbound threads can be increased via this registry parameter to a maximum of 23.

InOutThreads

Type: REG_DWORD Default Value: 6

This is the total number of shared inbound and outbound threads(threads doing In and Out MAPI).
By default, six threads are started; the maximum is 23.

InQueueHighWaterMark

Type: REG_DWORD Default Value: 0xFA0

When the number of inbound (destined for local delivery) messages reaches the value of InQueueHighWaterMark, the IMS refuses to accept new inbound SMTP messages. A higher value uses more memory, but allows more messages to be accepted.

InQueueRestartWaterMark

Type: REG_DWORD Default Value: 0xBB8

When the IMS is refusing inbound messages (because the InQueue reached InQueueHighWaterMark), if the number of messages in the InQueue falls below the value of InQueueRestartWaterMark, the IMS begins to accept new inbound SMTP messages. This value should be lower than InQueueHighWaterMark.

MaxReceivedHeaders

Type: REG_DWORD Default Value: 0x12

This parameter specifies the maximum number of hops a message can take before being returned as non-deliverable. This prevents infinite loops from occurring. The number is the count of received headers in the message. The default is 18 (0x12 hexadecimal).

MaxRecipients

Type: REG_DWORD Default Value: 0

This parameter specifies the maximum number of recipients allowed on a single transmission of an SMTP message.
See Knowledge Base article Q200389 for more details.

MessageTracking

Type: REG_DWORD Default Value: 0

Setting this entry to 1 turns on the message tracking functionality for the IMS. This is equivalent to selecting the similar check box in the Exchange Server Administrator program.

OutboundThreads

Type: REG_DWORD Default Value: 1

By default, the number of Outbound threads is 1. The number of Outbound threads can be increased via this registry parameter, but it has the upper limit of 23.

OutQueueHighWaterMark

Type: REG_DWORD Default Value: 0x61a8

When this many messages are queued in the OUT queue (which stores messages destined for remote SMTP servers), the IMS stops accepting messages.

OutQueueRestartWaterMark

Type: REG_DWORD Default Value: 0x3a98

If the IMS stops accepting messages because it has reached the high water mark, when the number of messages in the OUT queue falls below this number, the IMS will start accepting messages.

ResentHeadersHavePrecedence

Type: REG_DWORD Default Value: 0

If this parameter is set to TRUE, inbound mail gives RESENT headers precedence. For instance, a Resent-From header, if present, will be used to construct the From attribute on an inbound message.

ResolveP2

Type: REG_DWORD Default Value: 0

Setting this entry to 1 causes the IMS to resolve the sender's SMTP address against the DS for inbound messages. If set to 0 (the default), the IMS does no name resolution for sender fields (From, Reply-To, and so forth) on the inbound message and passes the information to the client for resolution. In most cases, this will cause the client to show the sender as a one-off sender, with an SMTP address, instead of matching his or her Exchange directory entry. See Knowledge Base articles Q166515, Q242301, and Q174755 for more details.

RootDir

Type: REG_SZ Default Value: x:\<exchsrv_dir>\imcdata

This parameter contains the location of the Imcdata directory.

SiteDN

Type: REG_SZ Default Value: /o=<organization>/ou=<site>

This parameter contains the x.500 directory name for the organization and site for this IMS.

SiteDomain

Type: REG_SZ Default Value:

This parameter names the domain to be used in the originator address for reports generated by the IMS. It overrides the site address, if one is present.

SMTPRecvTimeout

Type: REG_DWORD Default Value: 0x12c

This parameter defines SMTP protocol time-out waiting for packet transmission. These time-outs can be set to zero, so that packet transmission never time-outs. However, this is not recommended because it could cause the IMS to hang.

SMTPWaitForAck

Type: REG_DWORD Default Value: 0x12c

This parameter defines (in seconds) the SMTP protocol time-out for an OK response to a command sent to another host.

SMTPWaitForBanner

Type: REG_DWORD Default Value: 0x12c

This parameter defines SMTP protocol time-out (in seconds) for a HELO banner from another host.

SMTPWaitForDataBlock

Type: REG_DWORD Default Value: 0x258

This parameter defines SMTP protocol time-out for waiting for the other host to send the CRLF.CRLF termination to the data block.

SMTPWaitForDataInitiation

Type: REG_DWORD Default Value: 0x78

This parameter defines SMTP protocol time-out for waiting for the other host to start transfer of the data block.

SMTPWaitForDataTermination

Type: REG_DWORD Default Value: 0x258

This parameter defines SMTP protocol time-out for waiting for a response from the other host to the .CRLF data termination.

SMTPWaitForMailFrom

Type: REG_DWORD Default Value: 0x12c

This parameter defines SMTP protocol time-out for waiting for a response to the MAIL command.

SMTPWaitForRcpt

Type: REG_DWORD Default Value: 0x12c

This parameter defines SMTP protocol time-out for waiting for a response to the RCPT command.

ThreadsPerProcessor

Type: REG_DWORD Default Value: 0x3

You can increase the number of resolver threads and SMTP worker threads that are available when the IMS starts, but only by increasing the value assigned to the ThreadsPerProcessor variable.

SMTP worker threads are calculated by multiplying the number of processors by the ThreadsPerProcessor.
Resolver threads are calculated as two times the ThreadsPerProcessor.

UseRTFText

Type: REG_DWORD Default Value: 0x1

UseRTFText specifies if reply-and-forward text is quoted in outgoing non-TNEF messages. If it is enabled (non-zero), Internet-style quoting is applied to reply-and-forward text by inserting a greater-than sign (>) before each line. If UseRTFText is disabled (set to zero or not present), no Internet-style quoting is applied. UseRTFText is enabled by default.

WarnedAboutTCPIPConfig

Type: REG_DWORD Default Value: 0

A value of 1 means that the dialog box stating that the administrator must correctly configure DNS before using the IMS has been displayed in the Administrator program.

Internet Mail Service Diagnostic Logging

Diagnostics logging levels determine which Exchange Server events are written to the Windows NT Event Viewer logs. An *event* is any significant occurrence in a system or application. You can configure diagnostic logging for Exchange Server components to record only highly significant events, such as an application failure, or moderately important events, such as receipt of messages across a gateway, or events relevant only to debugging. Normally, you want to log only critical events.

Note Diagnostics logging affects events only. It does not affect error messages, error alerts, message tracking, or utility logs.

Diagnostic logging can be used to get more detailed information about certain components within the IMS.
It is available for the following components:

- Addressing
- Message transfer
- SMTP interface events
- Internal processing
- SMTP protocol log

- Message archival

Four logging levels are available

- None
- Minimum
- Medium
- Maximum

For more information: http://www.microsoft.com/exchange/

◆ ◆ ◆ ◆